above with respect to Table 2, even if the audio data is optimally configured based on the source production parameters and service provider's equipment, the actual sound that reaches the user may be less than optimal if the user's own audio equipment is not taken into account.

[0025] To address this problem, the program guide may include personalized information about the user's home audio electronics capabilities and speaker configuration. With this information, the processor 106 can then clearly indicate to the user, via an on-screen display or other indicating or annunciation system, how the user's home audio electronics should be configured for a given selected source. Although the optimal audio reproduction information can be, for example, sent to an audio or visual output mechanism showing the user how they can configure their home audio electronics for each channel they select, the burden is still on the user to conduct the actual configuration according to the information provided. Further, even if the information were made fully available to the user, the time required to manually configure the user's audio equipment according to the information may cause the user to miss a portion of the program, adding to the inconvenience. In addition, the user is required to reconfigure the audio equipment each time the service (e.g., the channel or the particular program) changes to maintain optimum audio reproduction, further adding to the user's burden.

[0026] Referring to Figure 1, the invention may include a control interface 114 between the processor 106 and the user's audio electronics 116 to automate the configuration process. The control interface 114 acts as a data link between, for example, the processor 106 in the terminal 100 and the audio equipment 116 so that the program guide information can be used to configure the audio equipment 116 directly and also to allow the audio equipment 116 to provide information to the processor 106 for generating the configuration data. The interface 114 itself can be implemented in different ways, such as via a digital interface between the receiver and the audio equipment, an infra-red link, hard-wired connections, wireless connections, or full integration of the audio equipment 116 into the terminal 100.

[0027] A digital interface or fully-integrated audio processing circuitry provides the potential for the most complete automation in the inventive system by allowing the receiver to automatically sense which speakers and what equipment is connected to the terminal at any given time. In this type of system, the processing modes of the user's audio equipment 116 would be automatically configured and switched as the service changes, making the equipment configuration task a seamless part of program changes or changing channels. For example, when a signal containing the audio configuration information travels through the delivery channel to the terminal 100 and control interface 114, the control interface 114 automatically communicates the audio configuration information in the program guide for the selected service to the user's audio equipment 116 (e.g., audio-visual receiver, digital television, speakers, sub-woofers, etc.). The audio equipment 116 then responds to the audio configuration information and configures itself according to the information, with no manual adjustment by the user.

[0028] Specific possibilities for the control interface 114 may be as simple as jumper cables connecting different audio devices in the user's system so that commands reaching one device in the system can be relayed to the other devices through the cable. The connection itself can be designed so that devices from the same manufacturer can communicate with each other. Other interface 114 alternatives would include any interface 114 that can provide the audio configuration functionality to the audio processing electronics in the user's audio devices 116. The protocol used for the interface can be a wired protocol (e.g., IEEE 1394 or a Universal Serial Bus) or a wireless protocol. Another alternative may include extending currently know protocols, such as the Sony-Philips Digital Interface (SPDIF) protocol, to include audio configuration data for all signal and service types rather than limiting the protocol to support of configuration data in a proprietary manner for limited types of signals.

[0029] As noted above, infrared links may also be used as the control interface 114 between the processor 116 and the audio electronics 116. The infrared link can be used to, for example, sense the relative positions of the audio electronic devices 116, obtain

information about the device processing capabilities, and other information that impact the optimization of the audio reproduction. Infrared links in general are already known in the art for data transmission and are used in, for example, remote controls and hand-held devices. Thus, the specific manner in which infrared links can be implemented in the inventive system is within the skill of those in the art.

[0030] Note that if the infrared link is only a one-way link (i.e., allowing communication only from the terminal 100 to the devices 116), conducting infrared control may require a calibration set-up process so that information about the audio devices 116, their processing capabilities, the number and location of speakers, etc., are entered into the program guide.

[0031] The implementation of the invention is not limited to the specific components and system described above. For example, instead of using a set-top box and a separate control interface, the invention can be incorporated into a single integrated device that contains all of the audio-visual receiver functions (e.g., the receiver, program guide, and control interface, etc.). Using an integrated system simplifies the optimization process by providing a seamless data path between the delivery channel, the receiver, the control interface, and the user's audio equipment and optimizes the audio environment accordingly.

[0032] Figure 2 shows an alternative implementation of the present invention. In this embodiment, the program guide database 108 and channel map database 110 are joined in a memory 200 that lies outside of the terminal 100. As described above, the program guide database and the channel map database contain source characteristic data and delivery channel capability data, respectively. The memory 200 can be located in, for example, the head end of the system or any other location outside of the terminal 100. In this embodiment, the program guide database 108 and the channel map database 110 may correspond to only one channel map.